Chapter Ten

CROSS SECTIONS

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Chapter Ten

CROSS SECTIONS

Chapters Four and Five “Geometric Design Tables” present the design values for the widths of the various cross section elements on new construction and major reconstruction projects. These are based on the functional classification (freeway, arterial, collector or local road or street). Chapters Four and Five also provide typical tangent and superelevated cross section figures. Chapter Two provides design values for cross section widths on 3R projects. Chapter Ten discusses cross section elements and provides additional information and guidance that should be considered in the highway design.

10-1.0 ROADWAY SECTION

10-1.01 Travel Lanes

10-1.01.01 Width

Travel lane widths will vary between 9 ft and 12 ft, depending upon the functional classification, traffic volumes and rural/urban location. Chapters Two, Four and Five provide specific criteria for travel lane widths for these various conditions.

10-1.01.02 Cross Slope

Surface cross slopes are required for proper drainage of through travel lanes on tangent sections. To determine the appropriate slope, the following will apply:

1. Two-Lane Highways. Crown the traveled way at the centerline with a cross slope of 1.5% – 2% sloping away from the centerline.

2. Multi-Lane Highways. For multi-lane highways, the following will apply:

   a. Undivided Facilities. For undivided facilities, crown the pavement at the centerline. The cross slope of the travel lanes adjacent to the crown should be 1.5% – 2%. The lanes beyond this should be sloped at 2%.

   b. Divided Facilities. For divided facilities, the pavement is crowned at the centerline of each roadway. For three-lane sections, the pavement is typically crowned along the lane edge between the middle lane and the lane adjacent to the median. The right two lanes are sloped to the outside and the median lane to the inside.

The cross slope of the lanes adjacent to the crown should be 1.5% – 2%. The lanes beyond this should be sloped at 2%.

c. Uneven Sections. Where an uneven cross section is used (e.g., three lanes in one direction and one lane in the other), or to match a short section of a new road to an existing section, it may be appropriate to place the crown line in a different location.

3. Breaks. In general, all cross slope breaks should occur at lane edges. One exception to this may be where a two-way, left-turn lane is provided.

4. Bridges. Carry the approach roadway cross section across the bridge.

10-1.02 Shoulders

10-1.02.01 Shoulder Widths/Types

Shoulder widths will vary according to project scope of work, functional classification, urban or rural location, traffic volumes and the presence of curbs. Chapters Two, Four and Five present the recommended shoulder widths for these various conditions. All shoulders on State routes should be paved. For roads under local jurisdictions, if requested by the municipality, a well-graded, stabilized aggregate or surface-treated shoulder will be acceptable. There should be no drop off between the traveled way and the graded shoulder. Where curbing is provided, the shoulder must be paved. The designer should also note that, in no case would the area outside of the curb be considered as part of the shoulder width.

10-1.02.02 Shoulder Cross Slope

The shoulder cross slope will vary depending on the shoulder width and whether or not there is curbing. Chapters Two, Four and Five provide the shoulder cross slope criteria. In addition, the designer should consider the following:

1. Narrow Shoulders. If the shoulder width is less than 4 ft, the shoulder cross slope will be the same as the travel lane cross slope. This applies to both tangent and superelevated sections.

2. Shoulder Adjacent to Traveled Way (Tangent Section). For highways without curbs, the typical shoulder cross slope is 4%. Where curbs are present, the typical shoulder cross slope is 6%. Where wide shoulders are used with 4-in curbing, use a 4% cross slope. The designer should verify that the depth of storm water does not exceed the height of the 4-in curb.

3. Shoulder Adjacent to Traveled Way (Superelevated Section). On the low side, the shoulder cross slope will remain equal to its rate on the tangent section until the

superelevated rate exceeds that value. Then, the shoulder will be sloped at the same rate as the superelevated travel lanes.

On the high side, the break between the travel lane and shoulder cross slope will be designed according to the miscellaneous detail in Figures 4H and 5J. The location of the break is dependent on the width of the shoulder. Shoulders less than 4 ft are not broken. This detail applies to the entire range of superelevation rates (1.5% to 6.0%).

4. Shoulders on Bridges. On bridges, the shoulder cross slopes will match the approach roadway shoulder slopes.

5. Ramps. For ramps, the following will apply:

   a. Tangent Section. The lower side shoulder will slope at the same rate as the travel lane. On the high side, the last 4 ft will slope away in the same manner as the high-side shoulder adjacent to a superelevated mainline (see Figure 12-4B).

   b. Superelevated Section. The division between the ramp traveled way and shoulder may vary, and it is often determined by the pavement markings. Regardless of this division, 4 ft of the ramp width should slope away from the remaining ramp width on the high side of the superelevated section. The details of the break between the two sections will be determined by the detail in Figures 4H and 5J.

10-1.03 Turn Lanes

Turn lanes include left- and right-turn lanes. Chapters Two, Three and Four provide the specific travel lane and shoulder width criteria for turn lanes. See Section 10-1.01.02 for turn lane cross slopes.

10-1.04 Parking Lanes

Chapters Two and Five provide the recommended widths for parking lanes. Where a parking lane is currently being used as a travel lane during peak hours, or where it may potentially be converted to a travel lane in the future, and if curbing is present, increase the parking lane width to 13 ft.

Many urban streets provide on-street parking. In addition to parking lane width, the designer must consider the following:

1. Capacity. In general, on-street parking reduces capacity, impedes traffic flow, produces undesirable traffic operations and increases the crash potential. Therefore, the designer should carefully consider these impacts before introducing on-street parking to an urban street. If these problems have become unacceptable on an urban street with existing on-street parking, the designer should eliminate parking. However, if sufficient replacement

off-street parking is unavailable, it may be impractical to completely eliminate the on-street parking. As an alternative, parking may be prohibited during peak traffic hours to improve the level of service during periods of maximum flow.

2. Parallel Versus Angle Parking. Parallel on-street parking is greatly preferred over angle parking. Angle parking has been associated with higher crash rates, because parked vehicles are required to back into the flow of traffic where adjacent parked vehicles may block the line of sight. Therefore, where on-street parking is being introduced to an urban street, the designer should provide parallel parking. Where angle parking currently exists, the designer should, if practical, convert these to parallel parking.

3. Intersection Sight Distance. Parking should be prohibited within the corner sight triangles for intersection sight distance at intersections and driveways. See Section 11-2.0 for the detailed criteria for intersection sight distance.

4. Railroads. Parking should be prohibited within 50 ft of the nearest rail of a railroad/ highway crossing.

Coordinate all design decisions related to on-street parking with the Division of Traffic Engineering.

10-1.05 Curbs

Curbs are used extensively at the outside of the shoulder on urban streets and occasionally on rural highways. Curbs contain the pavement drainage within the road and away from adjacent properties, provide pavement delineation, assist in channelization and driveway control for orderly roadside development, provide a physical separation between vehicles and pedestrians, and are considered aesthetically pleasing. However, do not use curbs on highways with design speeds of 50 mph or greater, except under special conditions.

10-1.05.01 Types

There are generally two types of curbs — sloping and vertical. By definition, sloping curbs have a height of 6 in or less with a batter no steeper than 3 vertical to 1 horizontal. Vertical curbs range in height, but are typically 6 in, with a batter steeper than 3 vertical to 1 horizontal. Typically, ConnDOT vertical curbs are vertical. The *Connecticut Standard Drawings* provide the design details for the various types of curbs used by the Department.

10-1.05.02 Safety

When impacted by a vehicle, curbs may result in the loss of vehicular control. In addition, a curb close to the travel lane may cause a driver to shy away, which reduces highway capacity. For these reasons, the disadvantages of a curb must be weighed against its benefits before a curb is introduced on any highway facility. Where a curb and barrier are used together, see Section 13-6.0 for design details.

10-1.05.03 Application on Low-Speed Roads/Streets

A low-speed road or street is defined as one that has a design speed of 45 mph or less. In urban areas, curbs have a major benefit in containing the drainage within the pavement area and in channelizing traffic into and out of adjacent properties. On rural, low-speed roads curbs should only be used where drainage is necessary or where roadside development is a problem.

The designer must also select the type of curb for the project. The following guidance should be used:

1. Non-State Facilities. On non-State highways, the curb should be the type that currently exists or should be as agreed upon with the local government.

2. 3R Projects. For 3R projects on State highways, the designer should match the existing curb type.

3. Curb Type. For major reconstruction or new construction projects on State highways, the designer should select the most practical type of curb. The *Connecticut Standard Drawings* provide the various curb types used by the Department (e.g., BCLC, concrete, stone curbing). The designer should consider initial cost, life expectancy, availability of materials, construction operations, maintenance requirements and appearance. For example, stone curbing may be justified on heavily traveled urban streets with parking lanes, street-cleaning operations and heavy use of de-icing materials. The superior durability of the stone curbing may make it a more cost-effective selection.

4. Stone Curbing. Whenever stone curbing is used, Department practice is that granite will always be used, except where existing curbs are bluestone.

5. Sidewalks. Where sidewalks are adjacent to the roadway or where they may be constructed in the future, curbs should be included in the project design.

6. Intersections. At intersections, curbs may be used to channelize vehicular paths and provide a target area for islands. In these cases, use sloping curbs.

7. Disabled. Curbs should be designed with curb ramps at all pedestrian crosswalks to provide adequate access for the safe and convenient movement of physically disabled individuals. See Section 15-1.0 for details on the design and location of curb ramps.

10-1.05.04 Application on High-Speed Highways

In general, curbs should not be used on highways with a design speed of 50 mph or greater because of their adverse effect on vehicular behavior when impacted. Their use is limited to these conditions:

1. Drainage. Where containing the drainage within the pavement area is absolutely essential, sloping curbs may be used. For more information, the designer should refer to the Department's *Drainage Manual* for more specific uses of a curb for drainage purposes.

2. Bridges. For approaches to a bridge superstructure, use concrete curbing or granite stone curbing. This curbing will transition to the protruding blunt end of the bridge curbing and, therefore, helps guide the motorist away from the bridge curb and prevents plow damage to the structure. On a one-way structure, the transition curbing serves no purpose on the trailing end and should not be provided, unless required for drainage.

3. Raised Medians. Sloping curbs are acceptable for design speeds up to 50 mph.

Where curbing is determined to be necessary, use a 4-in sloping curb as shown in the *Connecticut Standard Drawings.*

10-2.0 ROADSIDE ELEMENTS

10-2.01 Sidewalks

10-2.01.01 Guidelines for Sidewalk Construction

ConnDOT Policy "HWYS-19 — SIDEWALKS" provides the Department's guidelines for when a new sidewalk should be considered or where an existing sidewalk should be replaced. This Policy also discusses the State's municipalities' funding and maintenance responsibilities.

10-2.01.02 Sidewalk Design Criteria

In determining the sidewalk design, the designer should consider the following:

1. Widths. Sidewalk widths may vary from 4 ft to 8 ft with 5 ft considered typical. On bridges, the typical width is 5.5 ft. High pedestrian volumes may warrant widths greater than 5 ft. In special cases (e.g., schools), the designer may need to conduct a detailed capacity analysis to determine the sidewalk width. Use the *Highway Capacity Manual* for this analysis.

2. Central Business District (CBD) Areas. The entire area between the curb and building is often fully used as a paved sidewalk.

3. Appurtenances. The designer should also consider the impacts of roadside appurtenances within the sidewalk (e.g., fire hydrants, parking meters, utility poles). These elements will reduce the effective width because they interfere with pedestrian activity. Preferably, place these appurtenances behind the sidewalk. If they are placed within the sidewalk, the sidewalk should have a minimum clear width of 3 ft to 4 ft. The clear width will be measured from the edge of the appurtenance to the edge of the sidewalk. The 3-ft minimum is necessary to meet the ADA requirements (see Section 15-1.0).

4. Cross Slope. The typical cross slope on the sidewalk is 2% towards the roadway. If the sidewalk is on an accessible route for disabled individuals, then the maximum cross slope will be 2% (see Section 15-1.0).

5. Buffer Areas. If the available right-of-way is sufficient, consider providing a buffer area between the curb and sidewalk. These areas provide space for snow storage and allow a greater separation between vehicle and pedestrian. The buffer area should be at least 2 ft wide to be effective. Provide a 2.5 ft wide separation where the strip accommodates utility poles with a minimum 1.5 ft clearance from the curb face. The designer should consider providing buffer areas between 8 ft and 10 ft wide. Buffer areas may also be used for the placement of roadside appurtenances, if necessary. However, this is undesirable because the proximity to the traveled way increases the likelihood of vehicle/fixed-object crashes. Also, their presence in buffer areas detracts from the appearance of the highway environment.

Section 13b-17-27 of the Department's "Highway Encroachment Permit Regulations" contains additional information related to the design of sidewalks. Section 15-1.0 of the *Highway Design Manual* contains information related to accessibility requirements for disabled individuals that applies to sidewalk design.

10-2.02 Fill and Cut Slopes

Fill and cut slopes should be designed to ensure the stability of the roadway and be as flat as practical to enhance roadside safety. Much of the necessary information for design will be provided in the Soils Report, if one is necessary for the project. The designer should consider the following when selecting a fill or cut slope design:

1. Fill Slopes. Fill slopes should be 1:6 or flatter. All soils will be stable at this rate. Maintenance efforts are greatly reduced, the erosion potential is reduced, and the slopes are traversable at 1:6. For fill heights between 10 ft and 25 ft, 1:4 slopes are acceptable. For fill heights greater than 25 ft, 1:2 slopes protected by guiderail are typical. If site conditions require a slope steeper than 1:2, slope-retaining structures are normally used. The geotechnical engineer must approve any proposed slope steeper than 1:2. The typical section figures in Chapters Four and Five provide additional information on slope rates for various classes of highway.

2. Clear Zones. The steeper the fill slope, the greater the clear zone will be where guiderail is not provided (see Figure 13-2A).

3. Slope Rounding. Round slope transitions adjacent to shoulders at the top of fills. As indicated in the typical cross section figures in Chapters Four and Five, the recommended rounding is 8 ft. Measure this from the edge of the shoulder to where the rounded section intercepts the fill slope. For safety purposes, this will be sufficient with one exception. Where the design speed is 70 mph and where an unprotected 1:4 slope is provided, the recommended rounding distance is 11 ft. (Note: Rounding is not necessary on fill slopes protected by guiderail).

   The typical rounding at the toe of a fill slope and at the top of a cut slope is 10.0 ft.

4. Erosion Control. Erosion possibilities should be minimized. To the extent practical, preserve the natural and existing drainage patterns. Severely rutted side slopes can cause vehicular rollover even on relatively flat slopes. In good soil, turf can be established on slopes as steep as 1:2. However, flatter slopes obviously reduce the erosion potential and should be used where feasible. The Department's *Drainage Manual* discusses erosion prevention in more detail.

5. Rock Cuts. Slopes up to vertical are possible in rock cuts using presplitting methods. Where practical, place the bottom of the rock-cut slope outside of the calculated clear zone. All jagged rock outcroppings exposed to possible vehicular impacts should be removed. Figures 4J and 5L provide details for rock cuts. The geotechnical engineer will determine the appropriate slope in rock cuts.

6. Earth Cuts. In earth cuts, a rounded swale will normally be provided. Deep earth cuts may warrant terracing. These reduce erosion and enhance soil stability. The recommendation of the geotechnical engineer will govern.

7. Slope Protection. Generally, earth cut or fill slopes should be 1:2 or flatter to ensure a stable slope upon which turf may be established. Under favorable soil conditions, earth slopes as steep as 1:1.5 may be used, provided a proper slope protection system is used.

   The slope protection system selected should be consistent with the context of the design and the surrounding environs. Because the treatment of slopes can greatly influence the public's acceptance and overall success of a project, the designer should consult with the geotechnical engineer, structural engineer, and landscape architect to identify appropriate slope protection alternatives. Where a vegetated slope is not a feasible alternative, crushed stone slope protection may be considered. However, due to its undesirable impact on aesthetics, minimize the use of this treatment.

10-2.03 Utilities

Consider the following:

1. Placement. Space for the placement of utilities is an integral part of the highway design process. To ensure adequate space for the placement of utilities, the designer should consider utility placement early in the design phase of a project's development.

2. Utility Test Pit Data (Cross Sections). For actual utility test pit data, show the existing location(s) of the underground utilities on the cross sections. Do not show theoretical (interpolated data between two actual test pits) location(s) of existing underground utilities on the cross sections.

10-3.0 MEDIANS

10-3.01 Median Widths

The median width is measured from the edge of the two inside travel lanes and includes the left shoulders if present. The design width will depend on the functional class, type of median, availability of right-of-way, construction costs, maintenance considerations, traffic operations at crossing intersections, safety and field conditions. Chapters Two, Four and Five provide the design range for median widths based on the functional classification and area type. In general, the median should be as wide as can be used advantageously. In addition, the designer should consider the following when determining the appropriate median width:

1. Left Turns. Consider the need for left-turn bays when selecting a median width.

2. Crossing Vehicles. A median should be approximately 25 ft wide to safely allow a crossing passenger vehicle to stop between the two roadways. In areas where trucks are commonly present (e.g., truck stops), increase the median width to allow trucks to stop between roadways. Median widths from 30 ft to 50 ft should be carefully considered. These widths may encourage drivers to attempt the crossing independently; however, they may not be wide enough to fully protect longer vehicles from the through traffic.

3. Signalization. At signalized intersections, wide medians can lead to inefficient traffic operations and may increase crossing times.

4. Median Barrier. A median barrier is warranted for medians 66 ft or less on freeways and other divided arterials. If feasible, the median should be wide enough to eliminate the need for a barrier.

5. Operations. Several vehicular maneuvers at intersections are partially dependent on the median width. These include U-turns and turning maneuvers at median openings, which are discussed in Chapter Eleven. The designer should evaluate the likely maneuvers at intersections and provide a median width that will accommodate the selected design vehicle.

6. Uniformity. In general, try to provide a uniform median width. However, variable-width medians may be advantageous where right-of-way is restricted, at-grade intersections are widely spaced (½ mile or more), or an independent alignment is practical.

7. Roadway Elements. Do not reduce the widths of the other roadway cross section elements to provide additional median width.

8. Wide Medians. Median widths in the range of 50 ft to 80 ft may cause confusion for drivers on the intended operations for the multiple intersections encountered (e.g., going the wrong way on a one-way roadway).

9. Preferences. Drivers prefer medians that are obviously narrow or are wide enough to provide adequate refuge to allow independent crossings.

The typical cross section figures in Chapters Four and Five illustrate typical median types and other design details for median cross sections.

10-3.02 Median Types

The type of median selected will depend upon many factors, including:

1. drainage,
2. availability for median width,
3. snow and ice impacts,
4. impacts of superelevation development,
5. urban or rural location, and
6. traffic volumes.

10-3.02.01 Flush Medians

Flush medians may be used on urban highways and streets. A flush median should be crowned to avoid ponding water on the median area. A slightly depressed median in conjunction with median drains can be used to avoid carrying all of the drainage across the travel lanes.

10-3.02.02 Raised Medians

Raised medians are often used on urban highways and streets, both to control access and left turns and to improve the capacity of the facility. Figure 5H illustrates a typical raised median.

Advantages

When compared to flush medians, raised medians offer several advantages:

1. Mid-block left turns are controlled.

2. Left-turn channelization can be more effectively delineated if the median is wide enough.

3. A distinct location is available for traffic signs, signals, pedestrian refuge and snow storage.

4. The median edges are much more discernible during and after a snowfall.

5. Drainage collection may be improved.

6. Limited physical separation is available.

Disadvantages

The disadvantages of raised medians when compared to flush medians are:

1. They are more expensive to construct and more difficult to maintain.
2. They may need greater widths to serve the same function (e.g., left-turn lanes at intersections) because of the raised island and offset between curb and travel lane.
3. Curbs may result in adverse vehicular behavior upon impact.
4. Prohibiting mid-block left turns may overload street intersections and may increase the number of U-turns.
5. They may complicate the drainage design.
6. Access for emergency vehicles (e.g., fire, ambulance) may be more difficult.

Design

If a raised median will be used, the designer should consider the following in the design of the median:

1. Design Speed. Raised medians should only be used where the design speed is 50 mph or less.
2. Curb Type. Either vertical or sloping curbs may be used.
3. Appurtenances. If practical, the placement of appurtenances within the median is strongly discouraged (e.g., traffic signal poles, light standards).
4. Width. The width of a raised median is measured from the two inside edges of the traveled ways and, therefore, includes the left shoulders. The width of a raised median should be sufficient to allow for the development of a channelized left-turn lane. Therefore, the typical width is 22 ft, which provides for:

   a. a 12-ft left-turn lane,
   b. a 2-ft shoulder between the turn lane and raised island,
   c. a 2-ft shoulder between the opposing traveled way and the raised island, and
   d. a minimum 6-ft raised island.

   If practical at an unsignalized intersection, a raised median should be 25 ft in width to permit storage of a vehicle crossing or turning left onto the mainline.

5. Minimum Width. Under restricted conditions, the recommended minimum width of a raised median should be 8 ft. This assumes a minimum 4-ft raised island with 2-ft shoulders on each side adjacent to the through travel lanes.

10-3.02.03 Depressed Medians

A depressed median is typically used on rural freeways. Depressed medians have better drainage and snow storage characteristics than flush or raised medians and, therefore, are preferred on major highways.

Figures 4F and 5G illustrate the use of depressed medians on rural and urban freeways and expressways. A depressed median should typically be 100 ft wide in rural areas and 90 ft wide in urban areas. This allows for the addition of future travel lanes on the inside while still maintaining a sufficient width of a depressed median. The designer should consider providing wider median widths, within the constraints of additional right-of-way and construction costs. When selecting a width for a depressed median, consider the following:

1. Median Barriers. All medians 66 ft or less on freeways will require a median barrier. Therefore, to eliminate the need for a median barrier, consider providing a depressed median width greater than 66 ft.

2. Slopes. Figures 4F and 5G illustrate a median slope range of 1:6 to 1:12; slopes greater than 1:10 should only be used if there is no median barrier placed on the slope. The designer should make every reasonable effort to provide a median width that will allow the flatter slopes but still provide the necessary depth for the depressed median.

3. Longitudinal Gradient. The center longitudinal gradient of a depressed median should be a minimum of 0.5%.

10-4.0 BRIDGE AND UNDERPASS CROSS SECTION

The bridge or underpass cross section will depend upon the cross section of the approaching roadway, its functional classification, and whether the project entails new construction, major reconstruction, 3R work (non-freeways), 4R work (freeways) or a spot improvement.

10-4.01 Bridges

This Section presents the Department's criteria for bridges that are within the limits of a new construction project (all functional classes) or within the limits of a major reconstruction project (non-freeways). The designer should reference the following sections for the Department's criteria on bridge widths for other conditions:

1. 4R freeway projects — Section 3-1.04.
2. 3R non-freeway projects — Section 2-7.02.
3. Bridge rehabilitation/replacement (freeways) — Section 3-1.04.
4. Bridge rehabilitation/replacement (spot improvements, non-freeways) — Section 3-2.03.

10-4.01.01 New Construction

This refers to bridges within the limits of a new construction project. In all cases, the full approach roadway width, including shoulders, will be carried across the structure. The approach width will be determined by the criteria in Chapters Four and Five. Where sidewalks are provided, they will be 5.5 ft wide as measured from the gutter line.

10-4.01.02 Major Reconstruction (Non-Freeways)

This refers to bridges within the limits of a major reconstruction project on a non-freeway facility. The Department's criteria are as follows:

1. Bridge Reconstruction. The bridge substructure and/or superstructure may be partially or entirely reconstructed as part of the major reconstruction project. For example, this would be necessary if the project included the addition of travel lanes. If this work includes rehabilitation of the bridge deck, carry the full approach width, including shoulders, across the structure. Connecticut General Statutes (CGS) 13a-86 requires a minimum bridge width of 28 ft on any 2-lane highway maintained by the Commissioner, exclusive of any sidewalk width. No exceptions to this criterion will be allowed, unless in the judgment of the Commissioner a lesser width is warranted. Note that the criterion in CGS 13a-86 does not apply to bridges on highways maintained by a municipality.

2. Bridges to Remain in Place. If an existing bridge within the project limits is structurally sound and if it meets the Department's design loading structural capacity, it is unlikely to be cost effective to improve the geometrics of the bridge. These are considered existing bridges to remain in place. However, the geometric deficiencies may be severe, and/or

there may be an adverse crash experience at the bridge. Therefore, the designer should consider widening the bridge to meet the approach roadway width as part of the major reconstruction project. Figure 10-4A provides the minimum widths for existing bridges to remain in place within the limits of a major reconstruction project. In addition, all existing bridge rails and the approach transitions will be evaluated to determine if they meet the Department's current criteria.

Functional Class	Design Year AADT	Clear Bridge Width (Note 1)
Arterial	All	Approach Traveled Way + 4 ft
Collector	0-1500	22 ft
	1500-2000	24 ft
	>2000	28 ft
Local	0-250	20 ft
	250-1500	22 ft
	1500-2000	24 ft
	> 2000	28 ft

Notes:

1. *<u>Clear Bridge Width</u>. This is the width between curbs or rails, whichever is less.*

2. *<u>Long Bridges (Locals/Collectors)</u>. For bridges on these facilities with a total length greater than 100 ft, the widths in the table do not apply. These structures should be analyzed individually considering the existing width, safety, traffic volumes, remaining structural life, design speed, costs to widen, etc.*

WIDTHS FOR EXISTING BRIDGES TO REMAIN IN PLACE
(Major Reconstruction Projects)

Figure 10-4A

10-4.02 <u>Underpasses</u>

The discussion in this Section will apply to all functional classes and to all project scopes of work.

The approaching roadway cross section, including clear zones, should be carried through the underpass. If an auxiliary lane passes through the underpass adjacent to the mainline, measure the clear zone distance from the edge of the auxiliary lane. The lateral clearances for any collector-distributor roads should be treated separately from the mainline, with its clear zone based on its own design speed, side slope and traffic characteristics.

When determining the cross section width of a highway underpass, the designer should also consider the likelihood of future roadway widening. Widening an existing underpass in the future can be extremely expensive and it may be warranted, if some flexibility is available, to allow for possible future developments. Therefore, the designer should evaluate the potential for further development in the vicinity of the underpass that would significantly increase traffic volumes. The Bureau of Policy and Planning should be consulted for its projections. As an example, a reasonable allowance for future widening may be to provide sufficient lateral clearance for one additional lane in each direction.

10-5.0 RIGHT-OF-WAY

For information on the types of rights-of-way (e.g., permanent, temporary, easements), the designer should review the Department's *Policies and Procedures for Property Maps*. The right-of-way width should be sufficiently wide to provide the selected cross section elements and dimensions, to provide proper drainage, to allow maintenance of the facility and to provide for future expansion of the cross section. However, restrictions along the highway corridor may require some compromises in determining the ROW width. In these cases, the selected highway cross section may be limited by the available ROW.

The following summarizes the Department's criteria for determining the ROW width:

1. <u>Freeways (All Projects)</u>. The upper range of the ROW width should be the sum of the travel lane and median width plus 100 ft beyond the edge of the outside travel lane on each side <u>or</u> side slope requirements, whichever governs. In urban areas, the minimum ROW width will be the sum of the travel lane and median widths plus the roadside clear zone on each side <u>or</u> side slope requirements, whichever governs.

2. <u>Other Arterials and Collectors (New Construction/Major Reconstruction)</u>. The ROW width will be determined on a project-by-project basis. In determining the ROW width, the designer should consider travel lane widths, median widths, roadside clear zones, utility strips, side slope requirements, etc.

3. <u>Other Arterials and Collectors (3R Projects)</u>. The acquisition of significant amounts of ROW is often outside the scope of a 3R project. Therefore, the existing ROW will often be unchanged by the 3R project. However, the designer should, wherever practical, secure additional ROW to allow cost-effective geometric and roadside safety improvements.

4. <u>Local Roads and Streets (All Projects)</u>. The ROW width will be as required for the purpose of the project and will be determined by the local government.

ROW width should be uniform, but this is not a necessity. In urban areas, variable widths may be necessary due to the existing development; varying side slopes and embankment heights may make it desirable to vary ROW width; and ROW limits will likely have to be adjusted at intersections and freeway interchanges. The following special ROW controls should also be considered:

1. <u>Sight Distances</u>. At horizontal curves and intersections, additional ROW may be warranted to ensure that the necessary sight distance is always available in the future.

2. <u>Restricted Areas</u>. In areas where the necessary ROW widths cannot be reasonably obtained, the designer should consider using steeper slopes, revising grades or using slope-retaining structures.

3. <u>Railroads</u>. On sections of highway adjacent to railroads, avoid any encroachment onto railroad ROW whenever feasible.

4. Interchanges. Special ROW considerations at interchanges are discussed in Chapter Twelve.

10-6.0 TYPICAL SECTIONS

Chapters Four and Five present several typical section figures for both normal and superelevated sections. The figures are based on:

1. rural or urban location;
2. multilane or 2-lane;
3. type of median (e.g., depressed, raised, with a median barrier); and
4. curbed or uncurbed.

In addition, Figure 5M presents a typical section for a high-volume/incident-management freeway. “Incident management” refers to events (e.g., crashes) that have the potential to produce major disruptions to the flow of traffic on a freeway. The critical feature of this typical section is the provision of a left shoulder with sufficient width to assist in accommodating traffic in the event of a highway incident in the interim.

The use of this typical section will be determined on a case-by-case basis.

10-7.0 REFERENCES

1. *A Policy on Geometric Design of Highways and Streets*, AASHTO, 2001.
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